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Separation control using plasma actuator: Simulation of plasma actuator[1] MEENAKSHI MAMUNURU, DOUGLAS ERNIE, TERRY SIMON, UWE KORTSHAGEN, University of Minnesota — We have simulated dielectric barrier discharge in atmospheric pressure air on a two dimensional domain approximating the plasma actuator geometry. The applied voltage to the exposed electrode is a nanosecond range Gaussian pulse with amplitude of 3.5 kV. When a positive pulse was applied, the plasma was intense. A higher thrust was obtained in the downstream direction. When a negative pulse was applied, a weaker plasma and smaller thrust in the opposite direction were seen. The charge accumulation on the dielectric, and the streamer formation process were seen to be drastically different for both the cases. The component of thrust acting perpendicularly down on the actuator surface was seen to be larger than the force in parallel direction for both discharges. We have examined the importance of including photoionization in the air chemistry. A thin semi-conducting layer on the dielectric would drain the charge after a discharge cycle and prevent the occurrence of a reverse discharge, and enhance the time averaged thrust in the downstream direction. We have included a thin conducting layer on the dielectric in our simulations and obtained preliminary results.

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